

ABSTRACT OF THE DISCLOSURE

The disclosure relates to fluid working devices including reciprocating internal combustion engines and pumps. A number of arrangements for pistons and cylinders of unconventional configuration are described, many intended for use in IC engines operating without cooling. Included are toroidal combustion or working chambers, some with fluid flow through the core of the toroid, pistons reciprocating between pairs of working chambers, fluid processing volumes partly surrounding portions of the cylinder, tensile valve actuation, tensile links between piston and crankshaft, energy absorbing piston - crank links, crankshafts supported on gas bearings, cylinders rotating in housings, injectors having components reciprocate or rotate during fuel delivery. In some embodiments pistons may rotate while reciprocating. High temperature exhaust emissions systems are described, including those containing filamentary material, as are procedures for reducing emissions during cold start by means of valves at reaction volume exit.